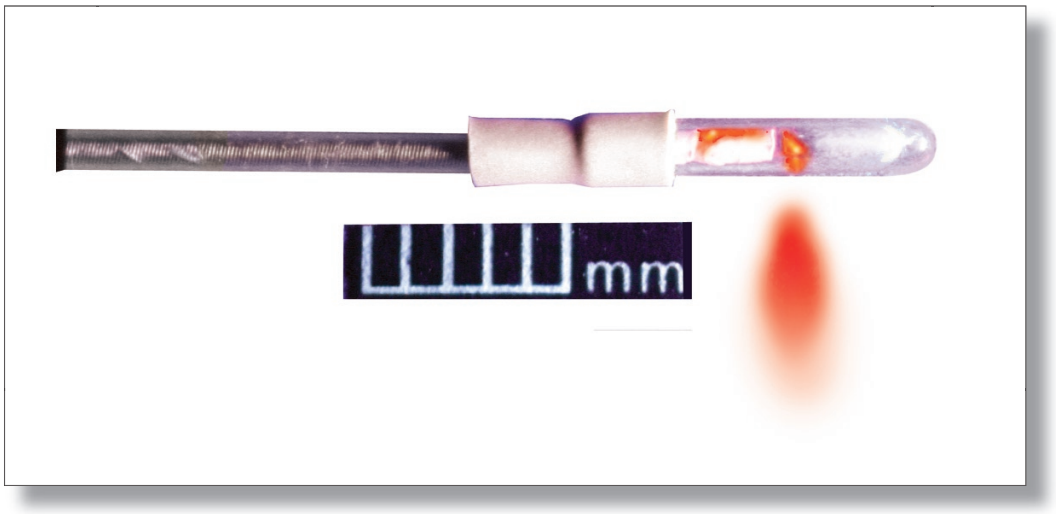
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

BREAKTHROUGH OPTICAL TECHNOLOGY—OPTICAL COHERENCE TOMOGRAPHY



Optical Coherence Tomography (OCT) can provide high-resolution, cross-sectional imaging similar to that of ultrasound, but it uses light instead of sound. OCT, an emerging technology based on fiber optics, often uses a compact diode light source similar to those used in compact disc players.

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Accomplishment

An Air Force Office of Scientific Research (AFOSR)-sponsored scientist, Dr. James Fujimoto, is the inventor and leading researcher of OCT, a new optical imaging tool for creating images used in medical diagnostics, materials science, and microscopy. Dr. Fujimoto, sponsored by AFOSR's Physics and Electronics Directorate, is a professor in the department of Engineering and Computer Science at the Massachusetts Institute of Technology in Cambridge, Massachusetts.

Background

OCT technology is robust, portable, low cost, and readily interfaced with optical fiber techniques to catheters, endoscopes, laparoscopes, and surgical probes. These attributes make it very attractive for medical and surgical diagnostics.

Ophthalmology, the study of the eye, is an area of medical research to benefit tremendously from this new technology, and the first area to have commercial instrumentation introduced. Researchers performed studies investigating the feasibility of using OCT for the diagnosis and monitoring of retinal diseases such as glaucoma, macular edema, macular holes, central serous chorioretinopathy, age-related macular degeneration, epiretinal membranes, optic disc pits, and choroidal tumors.

Other AFOSR-funded researchers developed valuable extensions and applications of OCT. Dr. Zhongping Chen, of the University of California, Irvine, developed Doppler OCT, which observes moving surfaces and is particularly valuable for studying blood vessel function and fluid flow, generally, in small structures.

Dr. Johannes de Boer, of the Massachusetts General Hospital (MGH), developed polarization-sensitive OCT and applied it to diagnosing burns. Drs. Brett Bouma and Guillermo Tierney at MGH, both former members of Dr. Fujimoto's group, developed very portable, high-performance OCT systems for clinical diagnostic studies. The US Army Institute for Surgical Research in San Antonio, Texas, is currently collaborating with several AFOSR-funded scientists to apply OCT to military medical needs.

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Additional information

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